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Patentanmeldung Nr. | Patent application No. | Demande de brevet n°

99120170.8

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Adhesives comprising linear, isotactic polymers

In Anspruch genommene Priorität(en) / Priority(ies) claimed / Priorité(s) revendiquée(s)

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ADHESIVES COMPRISING LINEAR, ISOTACTIC POLYMERS

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FIELD OF THE INVENTION

The present invention relates to adhesives used for example in assembling articles. Specifically, the present invention relates to elastic adhesives.

BACKGROUND

Adhesives and in particular adhesives comprising olefinic polymers are well known in the art and enjoy widespread usage throughout the industry. Typical areas of application of such adhesive include hygienic articles and in particular disposable absorbent articles, packaging materials, automotive parts, and the like.

Adhesives comprising commonly used polyolefins such as PP, PE, PS, PIB have a number of useful properties. They are bio-compatible and food compatible, chemically stabile, inert, non toxic materials. However, most of them have poor mechanical properties including insufficient strength/tear resistance, insufficient stretchability/elasticity and the like.

Several approaches have been proposed in the prior art to provide elastic properties to such adhesives. The most commonly used approach is based on changing the chemical structure of the polymer by introducing hinged joints/moieties into the main chain of the polymer. Thes hing s provide more

flexibility to the polymeric backbone preventing crystallization of polymer, lowering the glass transition temperature (Tg) and improving the elasticity of the resulting material. Usually, the hinge groups contain heteroatoms providing flexibility such as oxygen, nitrogen or chlorine placed into the main chain or into bulky side groups. Another approach is mastication of the polymer by blending with special plasticizing agents. Both approaches, however, require heteroatoms to be introduced into the molecule or into the bulk of the coating material.

The third approach proposed in the prior art to provide elastic properties to such adhesives, which is more close to the present invention, is to exploit the formation of hetero-phases which reinforce the bulk material by forming a physical net. To do this the block-co-polymerization of two or more different monomers has been used leading to polymeric backbones comprising blocks with different Tg. This results in micro-phase separation in the bulk with formation of reinforcing crystalline domains of one co-polymer linked with each other by flexible chains of the second co-polymer.

In essence, conventional adhesives carry a wide variety of inherent disadvantages including but not being limited to insufficient strength/tear resistance, insufficient stretchability/elasticity, not being bio-compatible, not being food compatible, comprising heteroatoms such as chlorine and hence leading to toxic residues when burnt, and the like.

It is an object of the present invention to provide adhesives which overcome the disadvantages of the prior art adhesives.

It is an further object of the present invention to provide articles which comprise elastic adhesives.

It is an further object of the present invention to provide a method for manufacturing adhesive of the present invention.

SUMMARY OF THE INVENTION

The present invention provides an article comprising a first element and a second element being joined to said first element by means of an adhesive. The article is characterized in that said adhesive comprises linear isotactic polymers having a structure of one or several C_2 to C_{20} olefins, the isotacticity of said polymers, due to a statistic distribution of stereoscopic errors in the polymer chain, being within the range of 25% to 60% of [mmmm] pentad concentration with the proviso that an arbitrary or rather regular sequence of isotactic and atactic blocks is excluded, the polymer having a mean molecular weight Mw within the range of from 100000 to 800000 g/mol and a glass temperature T_g of between -50 to +30 °C.

The present invention further provides a method for providing the aforementioned adhesive coating comprising a step of applying an adhesive coating selected from the group of hot melt, spray, powder melt, extruded bead, liquid, solvent based, pressure sensitive, and combinations thereof.

DETAILED DESCRIPTION OF THE INVENTION

The present invention provides adhesives comprising linear isotactic polymers having a structure of one or several C_2 to C_{20} olefins. The isotacticity of the polymers, due to a statistic distribution of stereoscopic errors in the polymer chain, is within the range of from 25% to 60% of [mmmm] pentad concentration with the proviso that an arbitrary or rather regular sequence of isotactic and atactic blocks is excluded. The mean molecular weight M_w of the polymer is within the range of from 100000 to 800000 g/mol and the glass temperature T_g is between -50 and +30 °C.

These polymers exhibit a semi-crystalline structure. The structure contains lastic amorphous areas of nano-scale-size reinforced with self arranged crystalline domains of nano-crystals. The formation of brittle macro-crystallin material from the polymer is achieved by introducing the defects into th polymeric

backbone. Isolated monomer units with opposite stereo configuration have been used as the defects, i.e. single stereo errors.

The polymers and a process for manufacturing such polymers are described in PCT patent application EP99/02379 incorporated herein by reference. A catalyst combination suitable for the preparation of such polymers is described in PCT patent application EP99/02378 incorporated herein by reference. Th se polymers differ in their elastic-thermoplastic behavior from the state of the art as represented for example by EP-A- 0 707 016. In particular, the polymers used in manufacturing the adhesives of the present invention have a distinctive rubb r-elastic plateau in their tensile-strength curves. The polymers of the present invention are bio-compatible and may be burnt without toxic residues since th y contain no heteroatoms such as chlorine.

In the prior art, a wide variety of suitable techniques to provide adhesive coatings are known such as applying an adhesive in a form including but not being limited to hot melt, spray, powder melt, extruded bead, liquid, solvent based, pressure sensitive, and combinations thereof. The aforementioned methods for providing adhesive coatings all have specific advantages which are known to th skilled person. Hence, the skilled person will be able to select a suitable method for providing an adhesive coating of the present invention depending on the specific requirement of the respective application of the adhesive.

The adhesive according to the present invention may also be used as a construction element in an article. Such articles include but are not limited to toys, furniture, clothing, shoes, sport equipment, complex constructions such as buildings, cars, household appliances, and the like. Having regard to the specific advantages of the polymers used for the articles of the present invention, it will be readily apparent to the skilled practitioner to apply and to optionally modify th adhesives according to th present inv ntion as construction el ments in the above and similar articles.

The adhesives of the present invention are suitable for joining non-sealable polyolefinic surfaces and for joining wood surfaces.

The adhesives are suitable for applications where the adhesive need to be stretchable, i.e. where the bonded surfaces of the first element and the second element should be allowed to make small movements relative to each other. For example, the adhesive of the present invention may be used as a binder resin for nonwoven web materials. The adhesive of the present invention will allow for further processing of such bonded nonwoven web materials such as for example mechanical activation such as by ring rolling.

The adhesives of the present invention may be ultrasonically activated.

CLAIMS

1. An article comprising a first element and a second element being joined to said first element by means of an adhesive
characterized in that
said adhesive comprises linear isotactic polymers having a structure of one or several C_2 to C_{20} olefins, the isotacticity of said polymers, due to a statistic distribution of stereoscopic errors in the polymer chain, being within the range of 25% to 60% of [mmmm] pentad concentration with the proviso that an arbitrary or rather regular sequence of isotactic and atactic blocks is excluded, the polymer having a mean molecular weight Mw within the range of from 100000 to 800000 g/mol and a glass temperature T_g of between -50 to +30 °C.

2. An article according to Claim 1 wherein said adhesive is stretchable.

3. An article according to Claim 2 wherein said adhesive is elastically expandable.

4. A polymeric adhesive according to any of the preceding claims wherein said linear, isotactic polymer is polypropylene.

5. An article comprising according to any of the preceding claims wherein said adhesive is deployed as a construction element.

6. A method for providing an adh sive coating comprising a step of applying an adhesive coating selected from the group of hot melt, spray, powder melt, extruded bead, liquid, solvent based, pressure sensitive, and combinations

thereof

characterized in that

said polymeric material comprises a linear isotactic polymers having a structure of one or several C_2 to C_{20} olefins, the isotacticity of said polymers, due to a statistic distribution of stereoscopic errors in the polymer chain, being within the range of 25% to 60% of [mmmm] pentad concentration with the proviso that an arbitrary or rather regular sequence of isotactic and atactic blocks is excluded, the polymer having a mean molecular weight Mw within the range of from 100000 to 800000 g/mol and a glass temperature T_g of between -50 to +30 °C.

ABSTRACT

The present invention relates to adhesives comprising polymeric material wherein the structure of the polymeric material contains elastic amorphous areas of nano-scale-size reinforced with self arranged crystalline domains of nano-crystals.

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